NEW CONTROL POINT NETWORK AND GLOBAL SHAPE ESTIMATES FOR IO. Nadezhdina I.[1], Oberst J. [2,1], Patraty V. [1], Shishkina L. [1], Zubarev A. [1], [1] MExLab (MIIGAiK Extraterrestrial Laboratory) 105064 Gorokhovskii pereulok 4, Moscow, Russia, [2] Deutsches Zentrum für Luft- und Raumfahrt Linder Höhe (German Aerospace Center) 51147 Cologne, Germany; fair-max@yandex.ru

Introduction. We have derived a new global control point network of Io and a best-fit sphere, spheroid, and tri-axial ellipsoid.

We have analyzed Galileo and Voyager images of Io (images taken from http://pds-imaging.jpl.nasa.gov/) to derive a new geodetic control point network for this innermost Jovian satellite. While Galileo CCD images are most detailed and geometrically stable, the Voyager Vidicon images are used for gap fill. As the Voyager images suffer from significant geometric distortions, they were calibrated by means of the planetary image processing package VICAR (see http://www-mipl.jpl.nasa.gov/external/vicar.html for details).

We used 53 images, a subset of 66 images used in previous control point network studies [1,2], but have carried out new point measurements. We used recently reconstructed Galileo spacecraft trajectory data, supplied by the spacecraft navigation team of JPL (see http://naif.jpl.nasa.gov/ for details).

A total of 1956 tiepoint measurements have been carried out, which were processed by bundle block adjustments. Measurements and block adjustment were performed by means of the «PHOTOMOD» software [3] which was especially adapted for this study to accommodate global networks of small bodies, such as Io.

As a result, a catalog of Cartesian three-dimensional coordinates of 197 control points was obtained. The control points have a mean overall accuracy of 4985.7 m RMS, where individual errors vary depending on image resolutions and numbers of images (Fig. 1). At present an analysis of the data is in progress. We determine best-fit spheres, spheroids, and tri-axial ellipsoids. The centers of the models were found to be shifted from the coordinate system origin attesting to possible errors in the ephemeris of Io. The control point network frame was used to produce a visualization of the 3-D models of Io (Fig. 2).

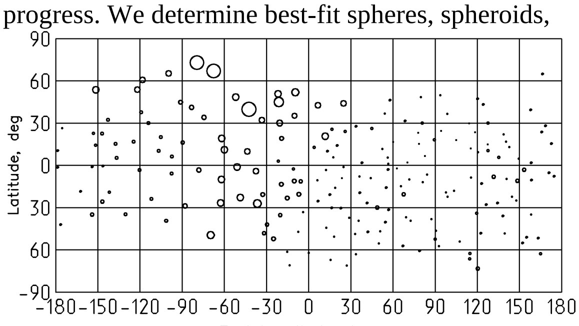

Figure 1. *Locations of control points. The sizes of the symbols are proportional to the errors in the coordinates, which range from 1.5 km (smallest symbol) to 25.0 km (largest symbol).*

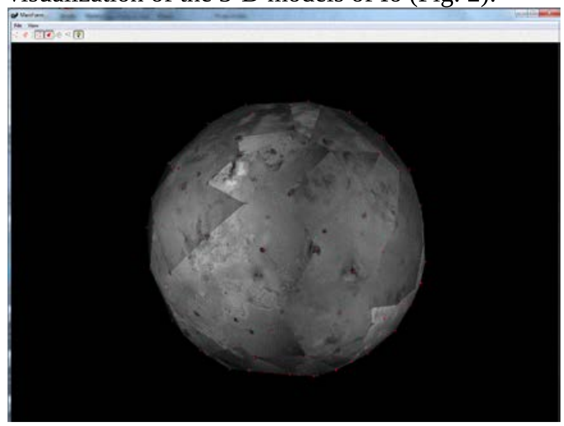

Figure 2. *3-D model of Io*

A comparison of our results with the most recent control point network analysis [2] reveals that we managed to derive the same accuracy of the control points using a smaller number of images and measurements (This study: 1956 measurements, DLR study: 4392). This probably attests to the fact that the now available new navigation data are internally more consistent. We report that control point measurements and global network analysis for small space bodies by means of the software «PHOTOMOD» is fast and efficient.

Our further plans include studies of librational motion and obliquity as well as the large-wavelength topography of Io.

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